

**Parasites of the Western Hemlock Looper, *Lambdina
fiscellaria lugubrosa* (Hulst), in Southeast Alaska**

(Lepidoptera: Geometridae)

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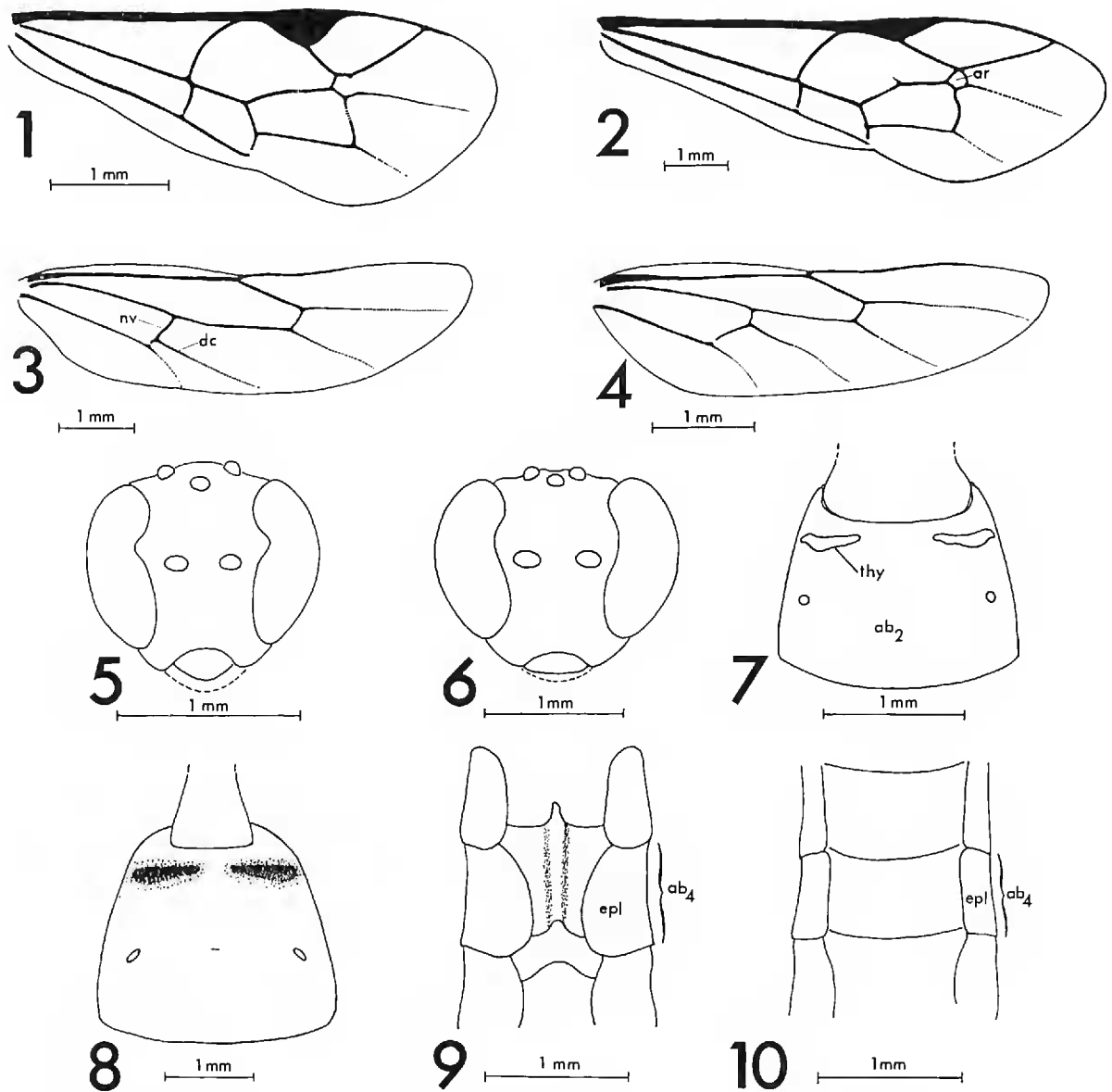
The western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst), was collected in Alaska for the first time in 1965. Field collections and laboratory rearings were conducted during 1966 to obtain life history data and to determine parasitization. Shortly after the completion of the 1966 field season, a salvage logging operation was carried out within and adjacent to the looper infestation. This permitted only a single season of fieldwork. Results of the preliminary studies dealing with the biology of the looper were reported by Torgersen and Baker (1967). The pupal parasites named below are probably only a partial list as the records are based on a single season's work.

PARASITES OF THE HEMLOCK LOOPER

Field collections and rearings contained looper eggs, larvae, and pupae. No parasites emerged from eggs or larvae. However, dissections of late-instar larvae revealed that 1.4 percent ($n = 350$) contained parasite larvae of unidentified species. Eight species of parasites (Ichneumonidae) were obtained from looper pupae: *Pimpla pedalis* Cresson, *P. aquilonia* Cresson, *P. hesperus* (Townes), *Apechthis ontario* (Cresson), *Itoplectis quadricingulatus* (Provancher), *Mastrus laplantei* Mason, *Cratichneumon ashmeadi* (Schulz) or species near it, and *Aoplus velox occidentalis* (Harrington).¹ *Pimpla hesperus* and *Cratichneumon ashmeadi* are new parasite records for *L. f. lugubrosa*. Table 1 lists the parasites according to their abundance. The range of parasitization within individual pupal collections for all parasite species combined was from 7 to 27 percent; mean parasitization was 10 percent.

The following key is designed to identify the ichneumonid parasite adults obtained from hemlock looper pupae in Alaska. Terminology follows that of Townes (1969). Characters used in separating several species are, in part, after Townes et al. (1960, 1965).

¹ Determinations were made by Insect Identification and Parasite Introduction Branch, ARS, Beltsville, Md. 20705.



FIGS. 1-10. Right forewings and hindwings, anterior view of heads, 2nd abdominal terga, and venter of 4th abdominal segments of looper parasites. FIGS. 1-2. Forewings. (1) *Mastrus laplantei*. (2) *Aoplus velox occidentalis*. FIGS. 3-4. Hindwings. (3) *Aoplus velox occidentalis*. (4) *Pimpla hesperus*. FIGS. 5-6. Anterior view of heads. (5) *Itoplectis quadricingulatus*. (6) *Pimpla pedalis*. FIGS. 7-8. Second abdominal terga. (7) *Cratichneumon ashmeadi*. (8) *Aoplus velox occidentalis* (♀). FIGS. 9-10. Venter of 4th abdominal segments (♀). (9) *Pimpla aquilonia*. (10) *Pimpla hesperus*. Legend: ab₂, 2nd abdominal tergite; ab₄, 4th abdominal segment; ar, areolet; dc, discoidella; epl, epipleurum; nv, nervellus; thy, thyridium.

KEY TO LOOPER PARASITES

1. Areolet absent (Fig. 1) *Mastrus laplantei* Mason
- Arolet (ar) present (Fig. 2) 2
- 2(1). Discoidella (dc) intersects nervellus (nv) below middle (Fig. 3) 3
- Discoidella intersects nervellus above middle (Fig. 4) 4
- 3(2). Thyridia (thy) separated medially by space greater than width of each (Fig. 7); head, thorax, and abdomen of both sexes black or fuscous *Cratichneumon ashmeadi* (Schulz)

	Thyridia separated medially by space less than width of each (Fig. 8); head, thorax, and abdomen of females ferruginous; males black, with clypeus and all, or part of face white	
 <i>Aoplus velox occidentalis</i> (Harrington)	
4(2).	Inner margin of compound eye markedly concave opposite antennal base (Fig. 5)	5
	Inner margin of compound eye not markedly concave opposite antennal base (Fig. 6)	6
5(4).	Face black	<i>Itopectis quadricingulatus</i> (Provancher)
	Face pale yellow (♂), or mostly black with yellow lateral margins (♀)	<i>Apechthis ontario</i> (Cresson)
6(4).	Hind tibia entirely black	<i>Pimpla pedalis</i> Cresson
	Hind tibia not entirely black; unicolorous amber or fulvous; or dark with pale band near proximal end	7
7(6).	Males	8
	Females	9
8(7).	Antennal scape entirely black	<i>Pimpla hesperus</i> (Townes)
	Antennal scape white or yellow in front	<i>Pimpla aquilonia</i> Cresson
9(7).	Epipleurum (ep1) of 4th abdominal tergite (ab ₄) only slightly longer than wide (Fig. 9); propodeal spiracle long oval; hind tibia unicolorous amber or fulvous	<i>Pimpla hesperus</i> (Townes)
	Epipleurum of 4th abdominal tergite more than twice as long as wide (Fig. 10); propodeal spiracle round or nearly so; hind tibia dark with a pale band near proximal end	<i>Pimpla aquilonia</i> Cresson

NOTES ON PARASITE BIOLOGY

Aoplus velox occidentalis comprised nearly 86 percent of all the parasites reared (Table 1). This species emerged from a collection made on 7 August containing newly formed pupae. Adults emerged from 23 August to 22 September, but heaviest emergence occurred from 29 August to 6 September. According to Heinrich (1960), species in the genus *Aoplus* overwinter as adult females; males die in the fall after mating. This species has been reared from both the eastern and western forms of *L. fiscellaria* in Canada and the United States; it was recorded by De Gryse and Schedl (1934) as *Amblyteles velox* in Ontario, and by Carroll (1956) in Newfoundland, Canada. Carolin² reared *A. velox* from the looper in Washington.

Three *Pimpla* species, *P. pedalis*, *P. aquilonia*, and *P. hesperus* comprised about 10 percent of the parasites reared (Table 1). The pupae from which these three species emerged were collected from 8 August throughout the month. Adult parasite emergence occurred throughout September. *P. pedalis* and *P. hesperus* emerged during the first half of the month; *P. aquilonia* emerged 2 through 26 September.

² V. M. Carolin. Studies on the western hemlock looper in southwest Washington in 1962. October, 1964. 26 pp., illus. Unpublished progress report on file, Pacific Northwest Forest and Range Experiment Station, Portland, Oreg.

TABLE 1. Parasites of the looper arranged according to abundance.

Parasite species	Number emerged	% Total emergence
<i>Aoplus velox occidentalis</i> (Harrington)	369	85.8
<i>Pimpla pedalis</i> Cresson	22	5.1
<i>Pimpla aquilonia</i> Cresson	14	3.3
<i>Apechthis ontario</i> (Cresson)	13	3.0
<i>Itopectis quadricingulatus</i> (Provancher)	5	1.2
<i>Pimpla hesperus</i> (Townes)	5	1.2
<i>Mastrus laplantei</i> Mason	1	.2
<i>Cratichneumon ashmeadi</i> (Schulz)	1	.2
	430	

Apechthis ontario was unique in that it was the only parasite that emerged from late-collected pupae. This species emerged during the third week in November from a collection made on 28 October. It appears that, under field conditions, at least some *A. ontario* overwinter in the host pupa and emerge in the spring. Carolin² made the same observation for this parasite of the looper in Washington. Parasitized pupae collected during the period from 11–30 August in Alaska produced *A. ontario* from 6 through 22 September. This represents the nonoverwintering segment of the population.

Several specimens of *Itopectis quadricingulatus* were reared. Collections made during the last 2 weeks in August produced adults by mid-September. This species was also reported as a parasite of the looper by Carolin² in Washington as well as by Hopping (1934), as *Ephialtes* (*I.*) *obesus*, in British Columbia. *Itopectis quadricingulatus* is a common parasite of the black-headed budworm, *Acleris gloverana* (Walsingham), and the hemlock sawfly, *Neodiprion tsugae* Middleton, both of which are sometimes important defoliators in southern coastal Alaska (Torgersen, 1968, 1970). Both the budworm and sawfly are attacked in the fall. It is likely that these two insects serve as alternate hosts for *I. quadricingulatus* emerging from the looper in the fall.

A single specimen of *Mastrus laplantei* was reared from a looper pupa collected on 30 August; emergence was on 18 September.

A single specimen, tentatively identified as *Cratichneumon ashmeadi* or a species near it, was also obtained. Heinrich (1960) indicates that members in this genus overwinter as larvae within the host. However, in the laboratory, this specimen emerged on 7 September from a pupa collected on 9 August.

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BOOK NOTICE

THE NEW FIELD BOOK OF FRESHWATER LIFE. By Elsie B. Klots, drawings by Suzan Noquchi Swain. G. P. Putnam's Sons, 200 Madison Ave., New York, N. Y. 10016. 398 pp., 92 figs., 22 pls., 8 in color. 29 July, 1966. \$4.95.

A most useful handbook, with emphasis on the aquatic communities. Plants, invertebrates, fishes, amphibians and reptiles are included, but not birds and mammals. The Insecta comprise Chapter 12 (pp. 169-263, figs. 47-71, pls. 15-18), and pp. 357-372. The latter section contains keys to the genera of ". . . a few frequently collected and popular groups of insects," which prove to be the nymphs of Plecoptera, Ephemeroptera and Odonata. In Chapter 12 there are modified keys, called "groupings," to the families of the orders of aquatic insects; some are to adults, some to immatures, and an extra one to Hemiptera is by habitats. There is much information on typical life histories. The book is, in a sense, dedicated to Dr. Ann H. Morgan, whose 1930 Putnam's Sons *Field Book of Ponds and Streams* has had wide recognition and use; she died two months before Dr. Klots' book appeared.—HUGH B. LEECH, *California Academy of Sciences, San Francisco 94118.*